

WHAT IS CLAIMED IS:

1. A micro mixer having at least one means of creating a time-varying force field for inducing homogenization of a first and second sample component within a micro mixer channel at a rate greater than that of diffusion alone, and wherein the time-varying force field creates a transverse force upon a sample interface between the first and second sample component.
2. A micro mixer of claim 1, wherein the time-varying force field used to generate a transverse force on a first sample component and a second sample component separated by a sample interface is at least one of a physical displacement field, electrical field, pressure field, or a magnetic field.
3. A micro mixer of claim 2, wherein the physical displacement field creates a transverse force using at least one well in the micro mixer channel.
4. A micro mixer of claim 2, wherein the physical displacement field creates a transverse force using at least one obstacle in the micro mixer channel.
5. The micro mixer of claim 2 wherein the electrical field is created by an AC or a DC source.
6. A micro mixer of claim 5, wherein the electrical field creates a transverse force using at least one electrode adjacent to the micro mixer channel, and wherein the electrode is activated to a selected first voltage and subsequently modulated to a second selected voltage at a selected interval to induce electrokinetic perturbations in the sample interface.
7. A micro mixer of claim 6, wherein the second selected voltage is zero volts.
8. A micro mixer of claim 5, wherein the electrical field creates a transverse force using at least one electrode adjacent to the micro mixer channel, wherein the electrode is activated to a first selected frequency and subsequently modulated to a second selected frequency to induce electrokinetic perturbations in the sample interface.

9. A micro mixer of claim 5, wherein the electrical field creates a transverse force by application of at least a first voltage at a first frequency by a first electrode and application of at least a second voltage at a second frequency by a second electrode, and wherein the first voltage and/or first frequency of the first electrode is modulated at a selected interval, and wherein the second voltage and/or second frequency of the second electrode is not modulated.

10. A micro mixer of claim 5, wherein the electrical field creates a transverse force by alternate application of a at least first voltage at a first frequency between a pair of electrodes and a second voltage at a second frequency between the pair of electrodes.

11. A micro mixer of claim 5, wherein the electrical field creates a transverse force by alternate application of a at least first voltage between a first pair of electrodes and a second voltage between a second pair of electrodes.

12. A micro mixer of claim 5, wherein the electrical field creates a transverse force by alternate application of a at least first voltage at a first frequency between a first pair of electrodes and a second voltage at a second frequency between a second pair of electrodes.

13. A micro mixer of claim 2, wherein the time-varying force field is a transverse force field created by introduction of a first sample into the micro mixer channel at a first flow rate and introduction of a second sample into the micro mixer channel at a second flow rate.

14. A micro mixer of claim 2, wherein the mechanical field creates a transverse velocity by a hydrodynamic pressure field.

15. A micro mixer of claim 14 wherein a hydrodynamic pressure field is created by at least one pressure reservoir in communication with at least one adjacent channel unit for the application of a transverse force upon the sample interface in the micro mixer channel.

16. A micro mixer of claim 15 wherein a pressure field is created by introducing a first sample into the micro mixer channel at a first rate and a second sample into the micro mixer channel at a second rate.

17. A micro mixer of claim 3 wherein the magnetic field creates a transverse force using at least one magnet adjacent to the micro mixer channel, and wherein the magnet is activated to a selected first polarity at a second direction and modulated to a second selected polarity at a second direction to induce electrokinetic perturbations in the sample interface.

18. A micro mixer of claim 2, wherein the transverse force is at an angle of 90° to the sample interface.

19. A micro mixer of claim 2, wherein the transverse force is at an angle of less than 90° to the sample interface.

20. A micro mixer of claim 1, wherein the micro mixer is open chambered.

21. A micro mixer of claim 1, wherein the micro mixer is close chambered.

22. A microdevice comprising a micro mixer having at least one means of creating a time-varying force field for inducing homogenization of sample components within a micro mixer channel at a rate greater than that of diffusion alone.

23. A method of inducing sample mixing utilizing a micro mixer having at least one means of creating a time-varying force field for inducing homogenization of sample components within a micro mixer channel at a rate greater than that of diffusion alone.